

## REMOTE HIGH RESOLUTION PHOTOGRAPHY AND VIDEO RECORDING USING A STREAMING VIDEO AS A VIEW-FINDER

### **Technical Field**

The technical field relates to remote photography, and, in particular, to remote high resolution photography using a streaming video as a view-finder.

### **Background**

With advancements in telecommunications, remote photography utilizing electronic remote devices becomes increasingly desirable. A person often finds a scene interesting or a moment worth remembering, only to discover that either no camera is available to capture the image or he/she is not in the best position to take the picture. Similarly, during a sports event, an audience typically is unable to take the best picture of the game from a distance seat using a personal camera. In addition, a party in a teleconference environment who wants to keep a photograph of another party will realize that low resolution video transmission typically cannot generate high resolution pictures.

Remote photography is currently available in limited circumstances. For example, theme parks normally provide electronic photography systems for capturing images of customers participating in rides or events with digital cameras. The images are later sent to the customers through a network after verification of customer information and/or payment information. However, the electronic photography systems only randomly take pictures of the customers, i.e., the customers have no active control over the digital cameras regarding either timing or more advanced features, such as zooming. In addition, the customers cannot preview any live-video before the image acquisition.

### **Summary**

A method for acquiring remote high resolution photographs by a user using a streaming digital video as a view-finder includes connecting a remote device controlled by the user to one or more photo-video acquisition devices, acquiring a high resolution photograph from the remote device using a video streamed from the one or more photo-video acquisition devices as a view-finder, and processing and transmitting the video and the high resolution photograph obtained from the one or more photo-video acquisition devices, using a joint video and still image pipeline.

In one embodiment, the one or more photo-video acquisition devices request payment information from a user who wishes to control the one or more photo-video acquisition devices, verify the payment information submitted by the user, and enable the user to control the one or more photo-video acquisition devices from the remote device.

1 The one or more photo-video acquisition devices may implement a queue system to allow  
2 multiple users to control the one or more photo-video acquisition devices in turn.

3 In another embodiment, a network server stores the video and the high resolution  
4 photograph, and either sends the video and the high resolution photograph to the user  
5 upon payment or posts the video and the high resolution photograph on a web page.

#### 6 **Description of the Drawings**

7 The preferred embodiments of the remote high resolution photography will be  
8 described in detail with reference to the following figures, in which like numerals refer to  
9 like elements, and wherein:

10 Figure 1 illustrates an exemplary joint video and still image pipeline;

11 Figure 2 illustrates an exemplary network and exemplary hardware components of  
12 a computer that may be used in connection with an exemplary method for acquiring  
13 remote high resolution photographs by a user using a streaming video as a view-finder;

14 Figures 3(a) and 3(b) illustrate how the exemplary joint video and still image  
15 pipeline of Figure 1 enables a user to acquire remote high resolution photographs through  
16 the exemplary network of Figure 2;

17 Figure 3(c) illustrates how the user may control a remote camera to acquire  
18 remote high resolution photographs through a point-to-point connection.

19 Figure 4 is a flow chart illustrating the exemplary method of Figure 2 for  
20 acquiring remote high resolution photographs by a user using a video streamed from a  
21 remote camera as a view-finder; and

22 Figure 5 is another flow chart illustrating how a user acquires remote high  
23 resolution photographs using a video streamed from a remote camera as a view-finder.

#### 24 **Detailed Description**

25 Using a joint video and still image pipeline technology, a network may be  
26 deployed through the Internet so that a user may acquire a remote high resolution  
27 photograph using a low resolution video streamed from a remote camera as a view-finder.

28 Figure 1 illustrates an exemplary joint video and still image pipeline. The  
29 exemplary joint video and still image pipeline is capable of delivering videos 120 and still  
30 images 110, i.e., photographs, at the same time. For example, while a video 120 is being  
31 viewed or recorded, a snapshot 102 may be taken to generate the still image 110. The  
32 processing of the videos 120 and the still images 110 may be in parallel. The joint video  
33 and still image pipeline is described, for example, in U.S. Patent Application, entitled  
34 "Concurrent Dual Pipeline for Acquisition, Processing and Transmission of Digital Video

and High Resolution Digital Still Photographs,” filed on the same day herewith, which is incorporated herein by reference.

The joint video and still image pipeline leverages existing processing from cameras, i.e., demosaicing, color processing, and image compression. Additionally, the joint video and still image pipeline takes advantage of existing expertise on digital video, i.e., video compression and video streaming and transcoding. The still images 110 typically have high resolution with, for example, 2-4 mega pixels. The high resolution still images 110 also have sophisticated demosaicing that leaves almost no demosaicing artifacts and high quality color correction that generates accurate color. On the other hand, the videos 120 typically have mid or low resolution with, for example, 640 x 480 resolution. In contrast to high resolution still images 110, the mid or low resolution videos 120 have fast demosaicing and fast color correction, which produces high frame rate. The video is then real time compressed and streamed with low delay and good error protection.

Figure 2 illustrates an exemplary network 230 and exemplary hardware components of a computer 220 that may be used in connection with an exemplary method for acquiring remote high resolution photographs by a user using a streaming video 120 as a view-finder. The network 230, such as the Internet or other type of computer or phone networks, connects a user's remote devices 222, 220 with one or more photo-video acquisition devices 240. The remote devices 222, 220 may be a handheld device 222 or a desktop computer 220, whereas the photo-video acquisition devices 240 may be remote video cameras.

The computer 220 typically includes a memory 202, a secondary storage device 212, a processor 214, an input device 216, a display device 210, and an output device 208. The computer 220 is connected to the remote video cameras 240 through the network 230, and may send commands to the cameras 240 and receive a streaming video and image 120 from the cameras 240. The memory 202 may include random access memory (RAM) or similar types of memory. The secondary storage device 212 may include a hard disk drive, floppy disk drive, CD-ROM drive, or other types of non-volatile data storage. The secondary storage device 212 may correspond with various databases or other resources. The processor 214 may execute applications or other information stored in the memory 202, the secondary storage 212, or received from the Internet or other network 230. The input device 216 may include any device for entering data into the computer 220, such as a keyboard, key pad, cursor-control device, touch-

1 screen (possibly with a stylus), or microphone. The display device 210 may include any  
2 type of device for presenting visual image, such as, for example, a computer monitor, flat-  
3 screen display, or display panel. The output device 208 may include any type of device  
4 for presenting data in hard copy format, such as a printer, and other types of output  
5 devices including speakers or any device for providing data in audio form. The computer  
6 220 can possibly include multiple input devices, output devices, and display devices.

7 Although the computer 220 is depicted with various components, one skilled in  
8 the art will appreciate that this computer can contain additional or different components.  
9 In addition, although aspects of an implementation consistent with the present invention  
10 are described as being stored in memory, one skilled in the art will appreciate that these  
11 aspects can also be stored on or read from other types of computer program products or  
12 computer-readable media, such as secondary storage devices, including hard disks, floppy  
13 disks, or CD-ROM; a carrier wave from the Internet or other network; or other forms of  
14 RAM or ROM. The computer-readable media may include instructions for controlling  
15 the computer 220 to perform a particular method.

16 Figures 3(a) and 3(b) illustrate how the exemplary joint video and still image  
17 pipeline enables a user to acquire remote high resolution photographs 110 through the  
18 network 230. Referring to Figure 3(a), the network 230 enables a user 322 to connect to  
19 one of the photo-video acquisition devices 240, such as remote video cameras, in the  
20 network 230 and to receive a video signal 120 that is being captured by the remote  
21 camera 240. In other words, the user 322 may use the received video signal 120  
22 transmitted by the remote camera 240 as a view-finder on the hand held device 222 or the  
23 desktop computer 220. When the user 322 perceives an interesting scene on the view-  
24 finder, the user 322 may take a high resolution photograph 110. If the cameras 240 are  
25 fixed, i.e., cannot be controlled or moved by any user 322, multiple users 322 can take  
26 high resolution photographs using a same camera 240 simultaneously.

27 Alternatively, a remote camera 240 may be controlled by a user 322, as illustrated  
28 in Figure 3(b). In order to control one of the cameras 240 for remote photography, the  
29 user 322 may need to log onto the remote camera 240 and submit personal information,  
30 such as internet protocol address, e-mail address, and payment information, such as credit  
31 card number. Each remote camera 240 may be a microcomputer with a memory (not  
32 shown), a microprocessor 340, an input device (not shown), an output device (not  
33 shown), and a network connection (not shown), similar to the computer 220. The  
34 microprocessor 340 in the remote camera 240 may verify the user's payment information

1 before granting access of control to the user 322. Verification of customer information is  
2 described, for example, in United States Patent No. 6,222,646, to Maurinus, et. al.,  
3 entitled "Electronic Photography System," which is incorporated herein by reference.

4 In addition, the microprocessor 340 may implement a queue system for multiple  
5 users 322 to control the same camera 240. With the queue system, only after a previous  
6 user 322 logs off the camera 240, may another user 322 log onto the same camera 240  
7 and exercise control 361. The control 261 may include tilting the remote camera 240 up  
8 or down, turning the camera 240 to the left or right, re-focusing the camera 240, or  
9 zooming the camera 240. The microprocessor 340 also controls motors in the remote  
10 camera 240 to perform the control commands received from the user 322.

11 The user 322 may use the remote camera 240 to view and record videos 120, as  
12 well as audio sounds. The user 322 may also acquire high resolution photographs 110,  
13 i.e., high resolution still images, at any time, using the video 120 streamed from the  
14 remote cameras 240 as a view-finder. The videos 120 and high resolution photographs  
15 110 may be processed and transmitted using the joint video and still image pipeline, 320  
16 and 310, respectively. Transmission of high resolution still images is described, for  
17 example, in United States Patent No. 6,108,027, to Andrews, et. al., entitled "Progressive  
18 Still Frame Mode," which is incorporated herein by reference.

19 After the videos 120 and/or the high resolution photographs 110 are acquired, the  
20 videos 120 and/or the high resolution photographs 110 may be saved in a storage 350 on a  
21 network server, such as a multimedia database connected to the network 230. The  
22 handheld devices 222 typically has bandwidth restrictions for video transmission,  
23 whereas the network 230 may process high bandwidth transmission with high speed  
24 connection. Therefore, while the user 322 receives low quality streaming video 120 on  
25 the handheld device 222, the video 120 stored in the storage 350 may be of higher quality  
26 than the streaming video 120 used as a view-finder. Alternatively, if the user 322  
27 accesses the remote camera 240 from a desktop computer 220 with a high speed  
28 connection to the network 230, the streaming video 120 used as a view-finder may be of  
29 higher quality, due to the high bandwidth connection.

30 The videos 120 and/or the high resolution photographs 110 may be posted on a  
31 web page or may be sent to the user 322, for example, by e-mail, once payment has been  
32 secured. The user 322 may store the videos 120 and/or high resolution photographs 110  
33 in a local secondary storage 212, and may print the high resolution photographs 110 on a  
34 printer.

Figure 3(c) illustrates how the user 322 may control the remote camera 240 to acquire remote high resolution photographs 110 through a point-to-point connection, such as a direct wire connection, an infra-red remote control, or a telephone network. The user 322 typically connects to the remote camera 240 and receives low resolution video 120 through a communication channel, such as a direct wire connection, an infra-red channel, or a telephone network channel, which are well known in the art. The user 322 may also send control commands 362 to the remote camera 240 through a same or a different communication channel. After high resolution photographs 110 are acquired, the photographs 110 may be sent to the user 322 directly through similar channels or through the network 230.

As one example, in a mobile environment, a user 322 may use a handheld device 222, such as a cell phone or a handheld computer, to control and acquire high resolution photographs 110 using one of the remote cameras 240 in the network 230. The cameras 240 may be specially positioned to acquire from a wide angle pictures of, for example, a theme park, so that users 322 may acquire high resolution pictures 110 of themselves in the theme park using a streaming video 120 obtained from the remote cameras 240 as a view-finder. The high resolution photographs 110 may later be posted on a web page or emailed to the users 322 upon payment.

As another example, in a video conferencing environment where low resolution videos 120 are transmitted through a network, a party 322 may use another party's camera 240 to acquire a high resolution photograph 110 of the other party.

As yet another example, in a sports event, a user 322 may watch the sports event from a handheld device 222 through a remote camera 240 perfectly positioned to deliver the best view of the event. Using the handheld device 222, the user 322 may also record the entire event and/or acquire a high resolution photograph 110 using a video 120 streamed from the remote camera 240 as a view-finder.

Figure 4 is a flow chart illustrating an exemplary method for acquiring remote high resolution photographs 110 by a user 322 using a streaming video 120 as a view-finder. Step 410 involves connecting a remote device of the user 322, such as a handheld device 222 or a desktop computer 220, to one or more photo-video acquisition devices 240, such as remote video cameras, through a network 230 or other means, such as a direct wire connection, an infra-red remote control, or a telephone network. In order to exercise control over one of the remote cameras 240, the user 322 may need to provide payment information to the remote camera 240, step 412. After a microprocessor 340 in

1 the remote camera 240 verifies the payment information submitted by the user 322, step  
2 414, the user 322 may control the remote camera 240 from the remote device, step 416.  
3 The microprocessor 340 may implement a queue system to allow multiple users 322 to  
4 control a same remote camera 240 in turn, step 418.

5 Next, the network 230 enables the user 322 to view the video 120 streamed from  
6 the remote camera 240 and to acquire a high resolution photograph 110 from the remote  
7 device, using the streaming video 120 captured by the remote cameras 240 as a view-  
8 finder, step 420. The video 120 and the high resolution photograph 110 may be  
9 processed and transmitted in parallel using a joint video and still image pipeline, step 430.  
10 Accordingly, whatever the user 322 perceives on the view-finder is exactly what the user  
11 322 photographs, as in a single lens reflex (SLR) camera. The network 230 may store the  
12 video 120 and/or the high resolution photograph 110 in a storage 350 on a network server,  
13 step 440. The stored video 120 may be of higher quality than the streaming video 120  
14 used as a view-finder. The video 120 and/or the high resolution photograph 110 may then  
15 be sent to the user 322 upon payment, step 442. Alternatively, the video 120 and/or the  
16 high resolution photograph 110 may be posted on a web page, step 444, which enables  
17 the user 322 to download to a remote device, such as a desktop computer 220, step 446.

18 Figure 5 is another flow chart illustrating how a user 322 acquires a remote high  
19 resolution photograph 110 using a streaming video 120 as a view-finder. First, the user  
20 322 logs onto a network 230 from a remote device, such as a handheld device 222 or a  
21 desktop computer 220, step 510. The user 322 then selects a photo-video acquisition  
22 device 240, such as a remote video camera, in the network 230 for acquiring the high  
23 resolution photograph 110, step 520. The user 322 may need to submit payment  
24 information, step 530, in order to control the remote camera 240 through the network 230,  
25 step 540. Next, the user 322 views the streaming video 120 and acquires the high  
26 resolution photograph 110 from the remote device using the video 120 streamed from the  
27 remote camera 240 as a view-finder, step 550.

28 The user 322 may receive the video 120 and/or the high resolution photograph  
29 110 on a remote device, such as a desktop computer 220, from the network 230, step 560,  
30 and store the video 120 and/or the photograph 110 in a local storage 212 connected to the  
31 desktop computer 220, step 570. Finally, the user 322 may print the high resolution  
32 photograph 110 on a printer connected to the desktop computer 220, step 580.

33 While the method and apparatus for acquiring remote high resolution photographs  
34 using a streaming video as a view-finder have been described in connection with an

- 1 exemplary embodiment, those skilled in the art will understand that many modifications
- 2 in light of these teachings are possible, and this application is intended to cover any
- 3 variations thereof.

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